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19 December 1956

## MEMORANDUM FOR THE RECORD

SUBJECT: Visit with [ ] on Portable Hydrogen Generator

1. On 11 December 1956 the undersigned met with [ ] at [ ] to review progress and plan future work on the lithium hydride portable hydrogen generator.

2. Progress was not as great as had been expected. The large (22 liter) generator had not been started even and this represented the major part of the work which was to have been accomplished since the last visit. Continued work with the small (2 liter) generator uncovered the following facts:

a. temperature does not appear to be the controlling factor as far as generation rate is concerned. [ ] speculates that not more than a 2 fold rate increase would be experienced in going from 0°C to 40°C.

b. the controlling factor is probably the rate at which LiOH goes into solution. LiOH is a reaction product of the LiH / H<sub>2</sub>O reaction.



The solubility of LiOH in water is low - being only 12.7 grams per 100 ml at 0°C and only 17.5 grams per 100 ml at 100°C. When the LiH reacts with water it is coated with LiOH and this tends to stop the reaction. In order for the reaction to get underway again, the LiOH must be dissolved away from the LiH particle and this requires the introduction of fresh water. The rate of generation then is dependent on the particle size and rate of change of water in the generator and due to the fact that the solubility of LiOH changes as little with temperature, the reaction rate is reasonably temperature independent.

Particle size of the LiH is very important here inasmuch as this determines exposed surface area which in turn determines rate of removal of LiOH (assuming an excess of water is provided).

c. [ ] tried to induce an explosion by rapid addition of water to fresh, unreacted LiH. He got a tremendous surge of hydrogen evolved, but no explosion.

d. As would be expected, the amount of foam developed is a function of the type of water - much more foam being developed in swamp water than in distilled water.

e. [ ] observed that arsine or some other perhaps poisonous gas seemed to be generated due to impurities in the LiH.

3. The following work was planned:

DOC	9	REV DATE	26/6/60	BY	1517
ORIG COMP	256	ORI	36	TYPE	22
ORIG CLASS	3	PAGES	2	REV CLASS	C
JUST	22	NEXT REV	2010	AUTHOR	MR 70-2

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- a. [ ] will submit a progress report- including plans for future work. 25X1
- b. A check will be made of supplies to determine availability, cost, particle size, nature of impurities etc. of LiH.
- c. Tests will be run on particle size vs. time (holding T constant).
- d. Tests will be run on rate vs. temperature (holding size constant).
- e. Tests will be run to determine the maximum controllable rate in the small generator.
- f. An attempt to induce an explosion by the introduction of air into the generator (setting the mixture off with a spark coil) will be attempted.
- g. An analysis will be made to determine the nature of the impurities (arsenic, phosphorous, etc.) which are present in the LiH.
- h. The large, 22 liter, generator will be fabricated.

4. A tentative early January date was set for the next meeting. Sixty pounds of LiH will be shipped [ ] 25X1

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